



Nikki Harrington B.Sc. Hons. PhD.

Principal Hydrogeologist

Overview

Nikki has almost 20 years of experience in the application of environmental tracer techniques and numerical modelling approaches to improve the conceptualization of groundwater flow systems. Her PhD focused on the use of environmental tracers to investigate the movement of brines below salt lakes, with particular emphasis on the role of an aquitard on subsurface brine migration. During her eight years working in State Government, she was involved in numerous projects applying environmental tracer and numerical modelling approaches to resource assessment investigations in the Murray Basin, Eyre Peninsula and the South East of South Australia. These projects also caused her to work at the interface between science and water management, and she developed a strong interest in this area. A post-doctoral fellowship in Saskatchewan, Canada, on the use of dissolved oxygen and nitrogen isotopes to understand the sources and fates of dissolved metals and nutrients in groundwater, expanded her experience to a range of geological and hydrochemical settings. Between 2011 and 2015, Nikki worked as a Research Associate at the National Centre for Groundwater Research and Training, as Project Leader for the Goyder Institute-funded South East Regional Water Balance project. At IGS, Nikki has been the Principal Groundwater Modeller on a range of projects for the irrigation and mining industries and government sector, with a strong emphasis on development of robust conceptual models and fit-for-purpose model design.

Nikki has a demonstrated ability to deliver high quality work within required timeframes. She has experience in liaising at all levels with a wide range of stakeholders and an ability to focus on regional- as well as local-scale issues. Above all, Nikki has a strong commitment to producing high quality technical work to address a wide range of groundwater management questions.

Qualifications

- 2004 PhD. Flinders University, South Australia.
Thesis: *Sources and Fluxes of Water and Salt Below a Regional Groundwater Discharge Complex, South Eastern Australia.*
- 1998 B.Sc. Hons. Flinders University, South Australia.
(1st Class)
Thesis: *Geochemistry and Hydrologic Processes in the Evolution of Hypersaline Brines at a Groundwater Discharge Area, Raak Plain, Murray Basin, Australia.*
- 1997 B.Sc. Flinders University, South Australia

Employment History

2015-Present

Principal Hydrogeologist

Innovative Groundwater Solutions Pty Ltd.

2011 –2015

Research Associate

National Centre for Groundwater Research and Training, Flinders University

2004 – 2011

Hydrogeologist / Acting Senior Hydrogeologist

South Australia Government – Department of Water, Land and Biodiversity Conservation

2004 – 2005

Postdoctoral Research Fellow

University of Saskatchewan, Saskatoon, Canada

2002 – 2004

Hydrogeologist

South Australia Government – Department of Water, Land and Biodiversity Conservation

1999 – 2004

PhD Candidate

CSIRO Land and Water, Adelaide, and Flinders University of South Australia

2002

Hydrogeologist

Resource & Environmental Management (REM)

1999 – 2001

Hydrogeologist

URS Australia Pty. Ltd.

Major Projects

West Angelas groundwater model to optimise spring fed GDE management

Dec. 2019 – present, Rio Tinto

Koodaideri orebody, regional water supply and saltwater intrusion models

Oct. 2018 – present, Rio Tinto

Hydrogeological Investigation and Sinkhole Risk Assessment

July 2018 – Present, BHP – Olympic Dam

Lower Limestone Coast Water Allocation Plan Risk Assessment

Mar. – Jul. 2019, South East Natural Resources Management Board

Water Balance Model for the Point Spring Sandstone Aquifer at Bonaparte Plains, Kimberley.

Aug 2018 – March 2019, WA Department of Primary Industries and Regional Development.

Groundwater Flow Model for the Cairn Hill Mine, South Australia

Sept. 2017 – Oct. 2018, Cu-River Mining Australia.

Padthaway Irrigation Aquifer Statement of Condition Report and Groundwater Model and Salinity Review

March 2018 – Aug 2018. Padthaway Grape Growers Association.

Analytical modeling to support Concept Design of the Northern Adelaide Irrigation Scheme Managed Aquifer Recharge Scheme

Oct. – Dec. 2017, Tonkin Consulting for SA Water Corporation

Preliminary Groundwater Flow Model for the Cairn Hill Mine Water Supply

Sep. – Oct. 2017, Cu-River Mining Australia

Independent Peer Review of Numerical Modelling for the Bird-In-Hand Gold Project

Apr. – Oct. 2017, Terramin Exploration

Shamrock Station Irrigation Development Stage 1 Hydrogeological Assessment

Mar. 2017 – present, Argyle Cattle Company

Winery Wastewater and Groundwater Reconnaissance Sampling

Feb. – Mar. 2017. Wingara Wine Group Pty. Ltd.

Preliminary Concept Plan for Aquifer Storage and Recovery to Support the Northern Adelaide Irrigation Scheme

Nov. – Dec. 2016, Tonkin Consulting for SA Water Corporation

Limestone Coast Irrigation Water Quality Project

July 2016 – February 2017. Limestone Coast Grape and Wine Council.

Groundwater Flow and Contaminant Transport Modelling for Mine Closure Planning

Jun. – Sep. 2016 and Jun. – Sep. 2017, Rio Tinto Iron Ore

Review and Interpretation of Hydrochemistry and Isotope Data for the West Canning Basin, Western Australia.

Mar. – Aug. 2016. Western Australia Department of Water

GDE Reconnaissance Survey, West Kimberley Water for Food Project

Feb. 2016 – Apr. 2016, Department of Water Western Australia

Groundwater models to evaluate alternative management options in Hynam East

Nov. 2013 – Feb. 2016, Hynam East Irrigator Group

Groundwater Monitoring Plan for PEL96 in the Southern Cooper Basin

Sep. 2014 – Sep. 2015, Strike Energy Ltd.

Investigation of Groundwater Characteristics in the Barossa Region using Environmental Tracers

June 2015, SA Department of Environment, Water and Natural Resources.

Lower Fitzroy River Groundwater Review

Mar. 2015 – May 2015, Western Australia Department of Water.

Lower South East Regional Water Balance Project

2013 – 2015, Goyder Institute for Water Research. *Project Leader; Task Leader.*

Lower South East Water Balance Framework

2012 – 2013, Goyder Institute for Water Research. *Task Leader.*

Preliminary reconnaissance of spatial and temporal variability of surface water – groundwater interactions around the South East drains.

2011 – 2012, Goyder Institute for Water Research.

Lower South East Water Balance Project

2010 – 2011, SA Department for Water. *Project Leader.*

Uley Basin Groundwater Modelling Project

2005 – 2006, SA Water and Eyre Peninsula NRM Board.

Abbotsford-Sumas Aquifer Nitrogen Isotope Study

2004-2005, University of Saskatchewan and Environment Canada.

Controls on the Isotopic Composition of Dissolved Oxygen in Groundwater

2004-2005, University of Saskatchewan.

Bookpurnong Al-Clogging Investigation

2003 – 2004, Loxton-Bookpurnong Salt Interception Scheme 2003-2004. *Project Leader.*

Environmental Tracers to Constrain Conceptual Hydraulic Models in the Loxton-Bookpurnong Region

2003 – 2004, Loxton-Bookpurnong Salt Interception Scheme. *Project Leader.*

Padthaway Salt Accession Project

2003 – 2006, National Action Plan for Salinity and Water Quality, 2003-2006. *Project Leader*

Sources and Fluxes of Water and Salt Below a Regional Groundwater Discharge Complex, South Eastern Australia.

2000 – 2004, PhD Thesis.

Publications

(please note that some publications were made under the maiden name of Howes)

International Peer-Reviewed Journals

1. Crosbie, R.S., Davies, P., **Harrington, N.** and Lamontagne, S. (2014). Ground truthing groundwater recharge estimates derived from remotely sensed evapotranspiration. *Hydrogeology Journal*. <http://dx.doi.org/10.1007/s10040-014-1200-7>.
2. **Harrington, N.M.**, Herczeg, A.L. and Le Gal La Salle, C. (2008). Hydrological and geochemical processes controlling variations in Na⁺-Mg²⁺-Cl⁻-SO₄²⁻ groundwater brines, south-eastern Australia., *Chem. Geol.*, 251, 8-19.

3. Wassenaar, L.I., Hendry, M.J. and **Harrington, N.** (2006). Decadal Geochemical and Isotopic Trends for Nitrate in the Transboundary Abbotsford-Sumas Aquifer and Implications for Beneficial Agricultural Management Practices. *Env. Sci. Technol.* 40(15), 4626-4632.

Refereed Conference Papers

4. **Harrington, N.**, Woods, J., Werner, A., Harrington, G., Lamontagne, S., Crosbie, R. and Li, C. (2013) Developing a robust scientific framework to support water management in the South East of South Australia, *40th IAH Congress on Solving the Groundwater Challenges of the 21st Century*, 15-20 September 2013, Perth, Western Australia.
5. Crosbie, R., Davies, P., Harrington, G., Lamontagne, S. and **Harrington, N.** (2013). Using complementary methods for estimating groundwater recharge at a regional scale in the South-East of South Australia., *40th IAH Congress on Solving the Groundwater Challenges of the 21st Century*, 15-20 September 2013, Perth, Western Australia.
6. **Howes, N.M.**, Le Gal La Salle, C. and Herczeg, A.L. (2001). Evidence for brine circulation in a groundwater discharge zone., *Proceedings, Water-Rock Interaction 2001*, Sardinia, Italy, June 10-15, 2001, Swets & Zeitlinger, Lisse, Netherlands.
7. **Howes, N.M.**, Le Gal La Salle, C. and Herczeg, A.L. (2000). The use of environmental tracers to determine brine leakage from natural groundwater discharge zones and artificial evaporation basins., *Proceedings, 4th Environmental Engineering Research Event*, Victor Harbor, South Australia, November 21-24, 2000.
8. **Howes, N.M.**, Herczeg, A.L. and Le Gal La Salle, C. (1998). Geochemistry and hydrologic processes in the evolution of hypersaline brines at a groundwater discharge area: Raak Plains, Murray Darling Basin, Australia., *Proceedings, The Joint Congress of the 25th Hydrology and Water Resources Symposium and the 2nd International Conference on Water Resources and Environmental Research, "Water 99"*. Brisbane, Australia, July 6-8, 1999, The Institute of Engineers, ACT, Australia.

Technical Reports

1. Innovative Groundwater Solutions Pty Ltd. (2019). Influence of Density-Dependent Flow on Pumped Water Quality at Koodaideri. A report prepared for Rio Tinto by Innovative Groundwater Solutions, 10 July 2019. Commercial in Confidence.
2. Innovative Groundwater Solutions (2019). BHP Olympic Dam – Karst Study – Hydrogeological Investigation. A report prepared for Eco Logical Australia Pty Ltd by Innovative Groundwater Solutions. March 2019
3. Innovative Groundwater Solutions (2019). Water Balance Model for the Point Spring Sandstone Aquifer at Bonaparte Plains, Kimberley. A report prepared for the WA Department of Primary Industries and Regional Development by Innovative Groundwater Solutions. March 2019.
4. Innovative Groundwater Solutions (2018). Groundwater Flow Model for the Cairn Hill Mine. A report prepared for Cu-River Mining Australia by Innovative Groundwater Solutions. October 2018.
5. Innovative Groundwater Solutions (2018). Padthaway Unconfined Aquifer Groundwater Salinity Trend Review. A report prepared for the Padthaway Grape Growers' Association by Innovative Groundwater Solutions. June 2018

6. Innovative Groundwater Solutions (2018). Padthaway Unconfined Aquifer Groundwater Condition Report. A report prepared for the Padthaway Grape Growers' Association by Innovative Groundwater Solutions. June 2018.
7. Innovative Groundwater Solutions (2017). Analytical Modelling to Support Concept Design of the NAIS MAR Scheme. A report prepared for Tonkin Consulting by Innovative Groundwater Solutions. December 2017.
8. Innovative Groundwater Solutions (2017). A 2-Dimensional Model of the Water Balance of Weeli Wolli Creek. A draft report prepared for Rio Tinto Iron Ore by Innovative Groundwater Solutions, 26 September 2017.
9. Innovative Groundwater Solutions (2017). Shamrock Station Irrigation Development: Stage 1 Hydrogeological Assessment. A revised final report prepared for Argyle Cattle Company, 22 June 2017.
10. **Harrington, N.M.**, and Harrington, G.A., (2017). Best Management Practices for Irrigation Water Quality Issues in the Limestone Coast Region of South Australia. A report prepared for the Limestone Coast Grape and Wine Council and the South East Natural Resources Management Board by Innovative Groundwater Solutions. February 2017.
11. Harrington, G.A., and **Harrington, N.M.** (2017). Hydrochemistry of peat mound springs within Mandora Marsh, West Canning Basin, WA. A final report prepared for Department of Parks and Wildlife, Western Australia by Innovative Groundwater Solutions, 8 February 2017.
12. **Harrington, N.M.**, and Harrington, G.A. (2016). Preliminary Concept Plan for Aquifer Storage and Recovery to Support NAIS. A revised final report prepared for Tonkin Consulting by Innovative Groundwater Solutions, 13 December 2016.
13. **Harrington, N.M.**, and Harrington, G.A. (2016). A Survey on the Water Quality Issues Facing Irrigators in the Limestone Coast Region of South Australia. A final report prepared for the Limestone Coast Grape and Wine Council and the South East Natural Resources Management Board by Innovative Groundwater Solutions, 15 December 2016.
14. **Harrington, N.M.**, and Harrington, G.A. (2016). A Two-Dimensional Solute Transport Model of SO₄ Transport for the Hope Downs 1 In-Pit Storage Option. A report prepared for Rio Tinto Iron Ore by Innovative Groundwater Solutions, 19 September 2016.
15. Government of Western Australia. Department of Water. (2016). West Canning Basin – Sandfire Project. Hydrochemical & Isotope Interpretation Report. DRAFT. August 2016.
16. Harrington, G.A., and **Harrington, N.M.**, (2016). A preliminary assessment of groundwater contribution to wetlands in the lower reaches of Fitzroy River catchment. A report prepared for Department of Water, Western Australia by Innovative Groundwater Solutions.
17. Harrington, G.A., and **Harrington, N.M.** (2016). A hydrochemical assessment of groundwater recharge and flow in the Broome Sandstone Aquifer, La Grange Area, Western Australia. A report prepared for Department of Agriculture and Food, Western Australia by Innovative Groundwater Solutions, Final version, 21 June 2016.
18. Harrington, G.A. and **Harrington, N.M.** (2016). Hynam East Groundwater Model. Report No. 2: Model development, calibration and scenario testing. A report prepared for irrigators in the Hynam East Management Area, Lower Limestone Coast, Prescribed Wells Area. FINAL version, 19 February 2016.

19. **Harrington, N.M.**, and Harrington, G.A. (2015). Groundwater and spring monitoring in the southern Cooper Basin and Great Artesian Basin. A report prepared for Strike Energy by Innovative Groundwater Solutions. 8 December 2015.
20. **Harrington, N.M.** and Harrington, G.A. (2015). Investigation of Groundwater Characteristics in the Barossa Region using environmental tracers. A report prepared by Innovative Groundwater Solutions for Department of Environment, Water and Natural Resources, 17 July 2015.
21. Harrington, G.A. and **Harrington, N.M.** (2015). Lower Fitzroy River Groundwater Review. A report prepared by Innovative Groundwater Solutions for Department of Water, 15 May 2015. <http://www.waterforfood.wa.gov.au/pdf/lower-fitzroy-river-groundwater-review.pdf>.
22. **Harrington, N.**, Lamontagne, S, Crosbie, R, Morgan, L, Doble, R, Werner, A (2015). South East Regional Water Balance Project – Phase 2. Project Summary Report. Goyder Institute for Water Research Technical Report 15/39. http://www.goyderinstitute.org/uploads/Goyder_Tech_Report_15-39_Harrington%20et%20al.pdf
23. Morgan, L.K., **Harrington, N.**, Werner, A.D., Hutson, J.L., Woods, J., Knowling, M.J. (2015). South East Regional Water Balance Project – Phase 2. Development of a Regional Groundwater Flow Model, Goyder Institute for Water Research Technical Report Series No. 12/38. http://www.goyderinstitute.org/uploads/Goyder_Tech_Report_15-38_Morgan%20et%20al.pdf
24. Barnett, S., Lawson, J., Li, C., Morgan, L., Wright, S., Skewes, M., **Harrington, N.**, Woods, J., Werner, A. and Plush, B. (2015). A Hydrostratigraphic Model for the Shallow Aquifer Systems of the Western Otway Basin and South Western Murray Basin. Goyder Institute for Water Research Technical Report 15/15. http://www.goyderinstitute.org/uploads/15-15_Hydrostrat_model_RAC_v4.pdf
25. **Harrington, N.** and Li, C. (2015). Development of a Groundwater Extraction Dataset for the South East of South Australia: 1970-2013. Goyder Institute for Water Research Technical Report 15/17. http://www.goyderinstitute.org/uploads/15~17_Groundwater_Extraction_RAC_v3.pdf
26. **Harrington, N.**, Millington, A., Sodahlan, M.E. and Phillips, D. (2015). Development of Preliminary 1969 and 1983 Land Use Maps for the South East of SA. Goyder Institute for Water Research Technical Report 15/16. http://www.goyderinstitute.org/uploads/15~16_Historical_Land_Use_RAC_v3.pdf
27. **Harrington, N.** and Cook, P. (2014). Groundwater in Australia, National Centre for Groundwater Research and Training, Australia. Available at: <http://www.groundwater.com.au/publications>
28. **Harrington, N.** and Lamontagne, S. [eds.]. (2013). Framework for a regional water balance model for the South Australian Limestone Coast region, Goyder Institute for Water Research Technical Report Series No. 13/14.
29. **Harrington, N.** and Cook, P. (2012). Willunga Research Update. National Centre for Groundwater Research and Training report. Available at: http://www.groundwater.com.au/journal_papers

30. Villeneuve, S.A., and **Harrington, N.** (2012). Salinity Trends in the McLaren Vale PWA. A report by the National Centre for Groundwater Research and Training for the Adelaide & Mount Lofty Ranges Natural Resources Management Board. Available at: http://www.groundwater.com.au/journal_papers
31. **Harrington, N.**, Noorduijn, S. and Cook, P.G. (2012). Evaluation of Approaches to Modelling Surface Water – Groundwater Interactions Around Drains in the South East of South Australia. National Centre for Groundwater Research and Training report. Also Goyder Institute for Water Research Technical Report Series No. 12/1. Available at: http://www.groundwater.com.au/journal_papers
32. **Harrington, N.**, Wood, C. and Yan, W. (2011). Lower South East Water Balance Project. Phase 1 – Review of the Conceptual Model and Recommendations for a Modelling Approach. South Australia. Department for Water. DWLBC Report 2011/12.
33. **Harrington, N.M.**, Chambers, K. and Lawson, J. (2007). Primary Production to Mitigate Water Quality Threats Project. Zone 1A Numerical Modelling Study: Conceptual Model Development. South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2008/12.
34. Zulfic, D., **Harrington, N.** and Evans, S. (2007). Uley Basin Groundwater Modelling Project. Volume 2: Groundwater Flow Model. South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2007/4.
35. **Harrington, N.**, Evans, S. and Zulfic, D. (2006). Uley Basin Groundwater Modelling Project. Volume 1: Project Overview and Conceptual Model Development. South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2006/1.
36. **Harrington, N.**, Van den Akker, J. and Brown, K. (2006). Padthaway Salt Accession Study Volume 4: Summary, Conclusions and Recommendations. South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2005/35.
37. Van den Akker, J., **Harrington, N.** and Brown, K. (2006). Padthaway Salt Accession Study. Volume 3: Conceptual Models. South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2005/21.
38. Wohling, D., Davies, P., Leaney, F. and **Harrington, N.** (2005). Groundwater Salinisation in the Naracoorte Ranges Portion of the Padthaway Prescribed Wells Area. South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2005/27.
39. **Harrington, N.**, James-Smith, J. and Love, A. (2005). Environmental tracers to constrain conceptual hydraulic models in the Loxton-Bookpurnong region., South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2005/25.
40. **Harrington, N.**, Van den Akker, J., Brown, K. and Mackenzie, G. (2004). Padthaway Salt Accession Study. Volume 1. Methodology, Site description and instrumentation. South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2004/61.
41. **Harrington, N.** (2004). Investigation into the precipitation of Al-hydroxide during pumping of bores at Bookpurnong (Western's Highland Site) in relation to groundwater quality in the Loxton Sands Aquifer., South Australia. Department of Water, Land and Biodiversity Conservation. DWLBC Report 2004/40.

Lightly or Not Refereed Conference Papers

42. Morgan, L., Werner, A., Hutson, J. and **Harrington, N.** (2015). A Regional Water Balance model for the South East of South Australia: Challenges associated with shallow water table simulation. Goyder Water Forum 2015.
43. Crosbie, R., Davies, P., Harrington, G., Lamontagne, S. and **Harrington, N.** (2013). Using complementary methods for estimating groundwater recharge at a regional scale in the South-East of South Australia., Proceedings of the International Association of Hydrogeologists, Perth, 15-20 September, 2013.
44. **Harrington, N.**, Woods, J., Werner, A., Harrington, G., Lamontagne, S., Crosbie, R. and Li, C. (2013). Developing a robust scientific framework to support water management in the South East of South Australia. , Proceedings of the International Association of Hydrogeologists, Perth, 15-20 September, 2013.
45. **Harrington, N.**, Lamontagne, S., Crosbie, R., Woods, J., Werner, A., Morgan, L., Turnadge, C., Smith, S., Doble, R., Davies, P., Taylor, A. and Li, C. (2014). Development of a regional water balance model to support water management in the South East of South Australia, NRM Science Conference, University of Adelaide, 15-16 April, 2014.
46. **Harrington, N.M.**, Hendry, M.J., Wassenaar, L.I. and Birkham, T.K. (2004). New Trends in $\delta^{18}\text{O}$ vs Dissolved Oxygen Concentrations in Groundwater Observed Below the Key Lake Uranium Mine, Northern Saskatchewan, Canada. Abstract, Proceedings, Geological Society of America Annual Meeting, Denver, Colorado, USA, 7-10 November 2004.
47. **Howes, N.M.**, Le Gal La Salle, C. and Herczeg, A.L. (2001). Evidence for brine leakage from a groundwater discharge zone, Raak Plains, Victoria., 8th Murray Darling Basin Groundwater Workshop, Victor Harbor, SA, September 2001.
48. **Howes, N.M.**, Herczeg, A.L and Le Gal La Salle, C. (2001). Determining salt transport processes below natural playa lakes and a salt harvesting operation using stable isotopes and carbon-14. Abstract, Proceedings, 7th Australasian Conference on Isotopes in the Environment, Robertson, NSW, September 2001.